Myr KREBS VISCOMETER VK 2000

VISCOTECH HISPANIA S.L.

Viscotech Hispania S.L. would like to thank you for the purchase of this equipment and for your confidence in choosing our company.

We are commited to offer you the best and most reliable service.

Don’t hesitate to contact your local dealer for any question related to this viscometer.

Your Viscotech Hispania S.L. team

User manual

(Stand1.5 – 02/12)

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1 General information

1.1 Introduction

The Krebs VK 2000 is a high precision viscometer used for measuring the viscosity of paints, varnishes, adhesives, pastes and liquid inks according to ASTM D562 standard.

The viscometer delivers readings in three different units: krebs units, centipoises and grams. Its usability both in manual and automatic mode makes the Krebs VK 2000 an ideal viscometer for industrial and research applications.

1.2 Intended use

The Krebs VK 2000 viscometer has been specifically developed to fulfill viscosity measurements of paints, varnishes adhesives, pastes and liquid inks. Only skilled or specially trained personnel must operate the viscometer.

Everyone who works with the viscometer VK 2000 must strictly follow the security precautions and observe the safety rules of the laboratory.

It is not allowed to operate the viscometer for any other purpose as the one described in this chapter. No right to claim warranty will be granted if any of the above norms are disregarded.

1.3 Security symbols

Installation and operation of the viscometer are user-friendly and very easy if instructions of this manual are strictly followed.

Be aware that any use of this equipment out of the scope described by the manufacturer may compromise the security of the operator.

Besides this and in order to stress the points that may represent any risk both for the operator and the viscometer itself, this manual uses following symbols and messages:

DANGER

Wherever this symbol, along with the message DANGER, appears in this manual, it indicates a potential personal injury hazard or damage on the viscometer. For your security, strictly observe instructions provided.

CAUTION

Wherever this symbol, along with the message CAUTION, appears in this manual, it indicates that damages on the viscometer may occur if instructions are not observed.

For the proper operation of the equipment, instructions must be strictly observed.

INFORMATION

This symbol refers to specific details of the viscometer which must be specially considered because of their relevance.

Independent of the instructions contained in this manual, everyone who operates the Krebs VK 2000 viscometer is obliged to know and observe the security and hygienic measures of the laboratory where this device is operated.

Everyone who should operate and set up the viscometer must have completely read and understood these instructions before starting the operations.

1.4 Safety notes

Operator security may be at risk if instructions of this manual are not observed.

Please observe the following general precautions during operation of this instrument. Failure to comply with these precautions violates safety standards and the intended use of the instrument. Viscotech Hispania, S.L. is not liable for misuse of the instrument and failure to comply with basic safety requirements.

Instrument grounding

To avoid injury from electrical current, the instrument must be connected to the safety ground. The instrument is equipped with a three wire ground plug. The power outlet must be connected to the safety ground and must meet the International Electrotechnical Commission (IEC) regulations.

Caution: Voltage

Never remove instrument covers during operation. Component replacement as well as adjustments must only be carried out by trained personnel. Use only original spare parts when replacing any component. Unplug the unit before removing or opening the covers. Appliance coupler is considered as disconnecting device.

Danger in explosive environment

The instrument must not be operated in the presence of flammable gases. It is also forbidden to expose the instrument in environments where dangerous gas concentrations may occur.

Hazard of malfunction

To avoid damages on the instrument, it must be only operated in a controlled electromagnetic environment. According to this, transmitters such as mobile phones must not be operated near to it.
In case of malfunctions and/or service work, please turn off the instrument and contact your local dealer.

1.5 Certification, warranty and documentation

Certification Viscotech Hispania, S.L. certifies that this instrument has been tested and checked carefully. Its technical data has been verified before shipment to be in accordance with the published specifications. The instrument complies with applicable international safety regulations.

Warranty This MYR product is warranted against defects in material and workmanship for a period of 2 (two) years. Parts which prove to be defective during the warranty period will be repaired or replaced free of charge. No other warranty is expressed or implied. Unauthorized modification or repair by third party persons will void the warranty. The warranty will expire in case of improper or wrong use of the instrument and in case the warning and precautionary messages are not observed. Viscotech Hispania, S.L. is not liable for any occurring damage.

Once the warranty period has expired, we recommend to sign a maintenance contract in order to guarantee the perfect functionality of the instrument. For more information on this subject, please contact your local dealer.

Documentation This user manual will be supplied together with each instrument. Further copies can be ordered at the local dealer by giving the serial number of the instrument, the number of the user manual and the date of issue.

This user manual is available in the following languages: English and Spanish.

Errors and omissions excepted. Subject to amendment and improvement without further notice.

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2 Technical data

Krebs Viscometer VK 2000				
Power requirements	**voltage frequency**			**100-240V ±10% 50-60Hz**
	consumption			**0,2A**
	fuses			**1 x 2 AT**
Speed		**One unique speed: 200 rpm ±1 rpm**		
Viscosity range				
		UNIT	***RANGE***	***RESOLUTION***
		KU	**40,2 - 141**	**0,1 KU**
		g	**32 - 1.099**	**1,0 g**
		cP	**27 - 5.274**	**5 cP**
Accuracy		**± 1% of full scale**		
Repeatability		**± 0,5%**		
Dimensions		**32,5 x 19 x 50 cm**		
Weight		**8,5 kg**		
Operating conditions:		**from +10°C until +40°C (at a max. rel. humidity of 80% without condensation) altitude up to 2000 m M.S.L. for indoor use only.**		
Pollution degree:		**2**		
Overvoltage category:		**II**		
Protection category:		**IP 20**		

3 Setting up the viscometer

3.1 Reception and unpacking of the instrument

Follow these steps after receiving the instrument:

- Please check carefully the packaging box of the viscometer before removing it in order to find out transportation damages.
- Should the packaging box be broken or have suffered any other damage, please contact the shipping agency before opening it.
- Once you have taken the instrument out of the box, check if damages can be observed. Should this be the case, please inform the dealer that has delivered you the equipment.
- Remove all packing straps, protectors and accessories used during transport. Recyclable materials are to be disposed in the containers provided therefore.

Scope of delivered parts

- Krebs viscometer mod. VK 2000
- Standard KREBS-type spindle (blade spindle)
- Adapters for big and small cans (1 USA pint y ½ USA pint respectively)
- Adapter's supporting base
- Standard 600 ml beaker (low model), required for automatic Mode
- Mains cable
- User manual

3.2 Setup

To set up the Krebs viscometer VK 2000 is very simple, because it only requires the adjustment of the big and the small container adapters (to accommodate respectively cans of 1 and ½ pint) and the spindle.

For installation, proceed as follows:

- Open the box and remove the packing straps, the supporting foams and the accessories.
- Take the VK 2000 out of the box by holding it from its base and column.

! **By doing this, it is strongly recommended not to hit neither the head nor the spindle shaft (fitted now with a protective hood) because the mechanical system could be damaged.**

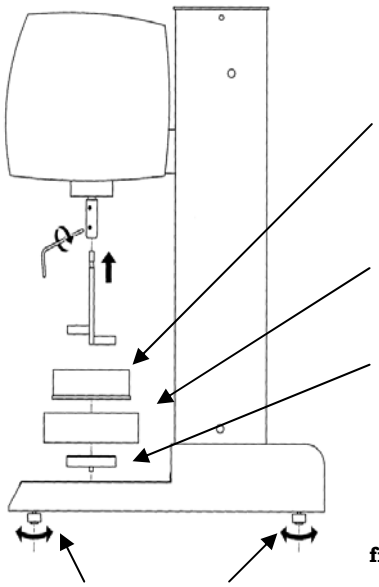


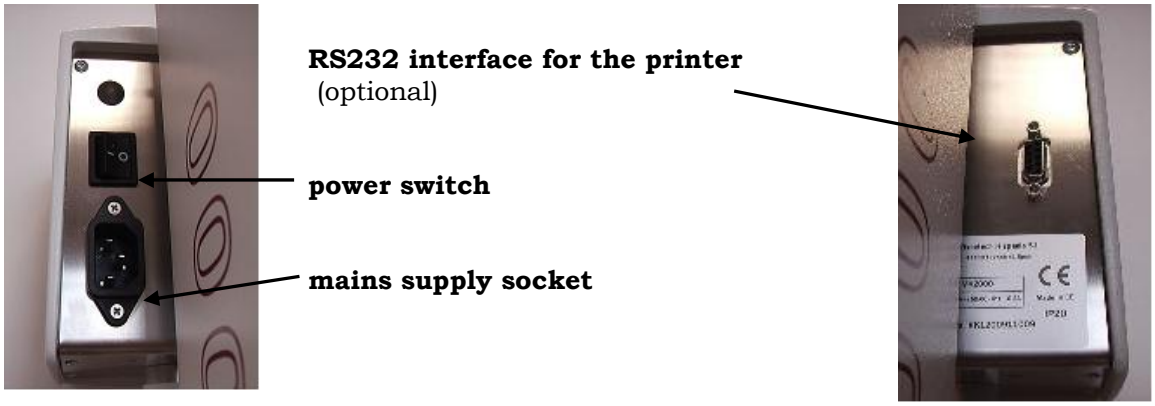
fig. 1

- Install the viscometer close to a power supply on a firm surface. Choose an installation site protected from vibrations or contacts that could have a negative influence on the results.
- Proceed levelling the viscometer by turning the adjusting feet located under the base of the viscometer (s. fig. 1)
- Locate the supporting elements for the cans according to the illustration.

! **Don't throw the box and the transport elements away as you could need them in case the viscometer should be returned to the manufacturer for reparation**

3.3 Instrument connections

All connections of the instrument are placed on the rear plate of the head, as the illustration below shows :



- Connect the cables in their respective positions.

CAUTION

Before turning on the instrument for the first time, please check if the power requirements indicated on the type plate correspond to the power supply being used.

DANGER

Be sure that the power supply where you connect the viscometer is electrically grounded.

3.4 Setting up the spindle

To set up the spindle, proceed as follows:

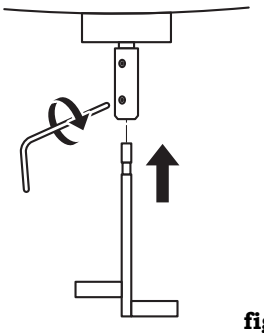


fig. 2

- Insert it through the hole of the pivot shaft until it reaches the maximum position (s. fig. 2).
- Tighten it slightly using a hex key turning it in a clockwise sense in order to clamp spindle to the pivot shaft through the anchoring zone.
- Pull the spindle down until it reaches the lowest position of the anchoring zone.
- Check manually that the spindle fits correctly.

4 Cleaning

DANGER

Before starting any cleaning operation, check that unit has been unplugged from the mains and that the spindle has been removed from the device.

The KREBS viscometer should be cleaned in regular periods of time. To carry out this operation, please observe following instructions:

- Use a clean piece of cloth to clean the instrument and the front panel.
- Avoid using solvents or cleaning agents to perform this operation.
- The spindle may be cleaned with solvents compatible with the sample to be analized.
- The spindle is made of stainless steel. Use therefore cleaning agents for this material.

CAUTION

Clean the spindle carefully to avoid bending it.

5 Operation

5.1 Initial turn-on and configuration

Before starting to work with the viscometer, the configuration of the equipment must be performed according to the specifications desired. The configuration menu allows you to select, in this order, the measurement units, the sample waiting time (SWT), the sample measuring time (SMT), the time and the date .

Initial turn-on and configuration

- Turn on the viscometer by pressing the mains switch placed on the rear panel of the viscometer. Afterwards, the presentation screen will appear on the display.

VK 2000 1.5

- To enter the configuration menu, press consecutively START and ENTER within the next 5 seconds.

Selection of measuring unit

By default, the display will show following information:

Working Units Ku

- Use UP and DOWN bottoms to scroll and select the measurement unit you want to work with: Ku (Krebs units), cP (centipoises) and g (grams).
- Once you reach the desired unit, press ENTER to confirm.

SWT (Sample Wait Time)

The SWT (Sample Wait Time) is the time that the spindle remains immersed in the fluid without any movement before starting the rotation. During this period of time, the sample stabilizes after experiencing some turbulence due to the immersion of the spindle. The display shows by default the following information.

SWT: 01 Sample Wait Time

By default, the SWT is set at 1 second. The viscometer allows you to select between 1 and 99 seconds, being the minimal selected possible time of 1 second.

- Use the UP and DOWN bottons to scroll and select the time you want the spindle to remain in the fluid before starting to rotate.
- When you reach the desired value, press ENTER to confirm.

SMT (Sample Measure Time)

The SMT (Sample Measure Time) is the rotation time of the spindle within the fluid before the viscosity reading appears on the display.

The SMT selected by default is 10 seconds. The viscometer allows you to select between 5 and 99 seconds, being the minimal selection time of 5 seconds.

SMT: 10 Sample Measure Time

- Use the UP and DOWN buttons to scroll and select the time you want the spindle to rotate in the fluid.
- When you reach the desired value, press ENTER to confirm.

Time and date

By default, display shows following information

TIME/DATE EU mode

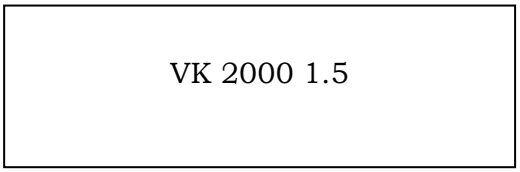
The viscometer offers you two different modes for date and time (which will appear permanently on the display): EU mode (European mode: day-month-year) and US mode (month-day-year).

- Use the UP and DOWN bottons to scroll and select the mode you desire to display DATE and TIME .
- When you reach the desired value, press ENTER to confirm.

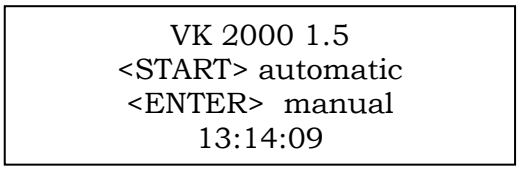
Set Clock EU mode	
Friday	(day)
04-12-09	(ddmmyy)
13:04:05	(hhmmss)

- Use the UP and DOWN bottons to scroll and select the **day of the week** (the first concept that flashes).
- When you reach the desired value, press ENTER to confirm.
- Select afterwards **the date**. Use the UP and DOWN bottons to scroll and select respectivelly the unit that flashes: day (dd), month (mm) and year (yy) –in the EU-mode–. Press ENTER after every selection to confirm the desired value.
- Proceed the same way to select the **time**. Use the UP and DOWN bottons to scroll and select respectivelly the unit that flashes: hour (hh), minute (mm) and second(s) (ss). Press ENTER after every selection to confirm the desired value.

After introducing the seconds and having confirmed with ENTER, the configuration setup will be finished. On the display appears then shortly the following information:



and afterwards:



The VK 2000 is now ready for operation. You can choose between automatic mode or manual mode.

5.2 (START) Automatic mode measurement

Start

The automatic mode allows you to work with any sample container that can be placed between the working platform and the spindle and that allows the viscometer to reach the lowest position. We recommend to observe the following instructions in order to achieve an standard and reproducible process routine:

- Place the sample container on its working position.
- Insert the spindle in its shaft as described in chapter 3.4.
- Lower the spindle manually until it reaches the lowest position (acoustic signal will be activated).
- Fill in the sample into the container until it reaches the level mark in the spindle. Write down the quantity of sample used.

By means of this standardized process you will be able to perform different measurements with the same working conditions. This will allow you to compare reliable the results.

INFORMATION:
Fill 450 - 460 ml of sample in the 600 ml beaker (low model) delivered with the instrument and start working in automatic mode.

It is possible to change measurement units, KU (Krebs units), cP (centipoises) and g (grams), by pressing UP and DOWN buttons on the working mode selection screen.

```
VK 2000 1.5
<START> automatic
<ENTER>  manual
13:14:09
```

- To begin working in automatic mode, just press START.

The display indicates SWT, SMT and measurement unit previously introduced during setup phase or already configured at the time the viscometer has been switched on:

```
automatic process
SWT: 01s. SMT: 05s.
Ku: 000.0
Press <START>
```

Use the UP and DOWN buttons to scroll and select SWT, SMT and measurement unit you want to work with.

- To confirm these values, press ENTER.
- Press START to lower the viscometer head.

Should the values on the display be OK, press START to begin with measurements.

automatic process
SWT: 01s. SMT: 05s.
Ku: 000.0
Going DOWN

SWT

When the spindle reaches its lowest position, the immersion time in the fluid begins to count down (SWT).

!

You may stop the process at this moment by pressing the STOP button, as showed on the display. In this case, the viscometer would return to its 'home' (upper) position and the display will show the working mode selection screen.

automatic process
SWT: 01s. SMT: 05s.
Going UP

SMT

Once the SWT is over, the spindle starts the rotation and the measurement time (SMT) begins to count down. During this process, the result of the reading appears on the display.

automatic process
SWT: 01s. SMT: 03s.
Ku: 121
<STOP> quit

!

You may stop the process at this moment by pressing the STOP button, as showed on the display. The viscometer remains in its position and the display shows the the working mode selection screen. Press START to enter the automatic mode and START again to initiate the measurement. If you wish to change to manual mode, press ENTER.

VK 2000 1.5
<START> automatic
<ENTER> manual
12:25:47

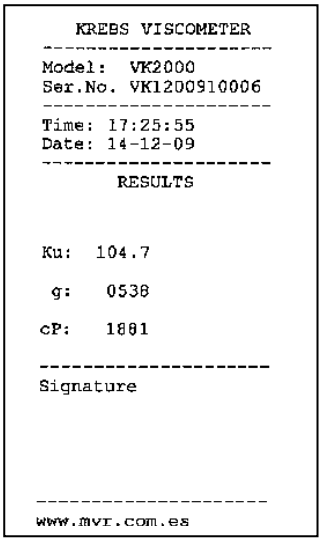
End

After completing measurement time, the viscometer head returns to its 'home' (upper) position. The final viscosity reading appears on the display together with the setup values (SWT, SMT and measure unit).

automatic process
SWT: 01s. SMT: 05s.
Ku: 000.0
<ENT> print <STP> quit

Print results

Should the viscometer be attached to a serial printer, it is possible to print the viscosity readings in 3 different units (Krebs, grams and centipoises) along with identification details of viscometer, and the date and time of operation by pressing ENTER (see fig. below).



In case that a failure in the lifting column comes up during the setup time established for lowering and lifting the viscometer head, the unit will get blocked. An alarm indication appears on the display and the equipment will emit a warning beep.

SECURITY STOP
mechanical
malfunction

When this occurs, the viscometer remains blocked and non operative, so as to avoid further damages on the main mechanics.

- Press **(STOP)** to switch the acoustic alarm off. The viscometer will still remain blocked.
- Please contact the Technical Service to solve this problem.

5.3 (ENTER) Manual mode measurement

Start

If you need to work with different containers and sample volumes, the spindle must then be positioned manually in order to immerse it at the right place in the sample. The manual mode helps you to perform this process.

It is possible to change measurement units, KU (Krebs units), cP (centipoises) and g (grams), by pressing UP and DOWN buttons on the working mode selection screen.

```
VK 2000 1.5
<START> automatic
<ENTER> manual
13:14:09
```

- Start this mode by pressing ENTER. After that, the display shows the following information:

```
<UP/DOWN> spindle
<START/STOP> measure
Ku: 000.0
<ENTER> print
```

UP/DOWN buttons: Use the UP and DOWN buttons to adjust the position of the spindle in the sample. It should be immersed in the fluid until the surface level of the sample reaches the notch in the spindle.

When the viscometer reaches the lowest position, an acoustic alarm beeps and the viscometer automatically stops.

! If you perform measurements with ½ pint USA, the spindle should be lowered before accommodating the can. As the length of the spindle blades is larger than the diameter of the can, the can must be slightly tilted to place it correctly.

START/STOP buttons: When the spindle reaches the desired position, press START or STOP to activate or stop respectively the rotation and the viscosity reading.

Printed data During measurement process, you can every time print a ticket with the viscosity readings and identification details of the unit by simply pressing ENTER.

! **When measurement is fulfilled, the viscometer head must return to its initial (upper) position by pressing the UP button. To realize that the position has been reached, the viscometer triggers an acoustic signal.**

6 About viscometer's calibration

The instrument delivered has been calibrated with certified patrons (in Krebs units) by the manufacturer before shipping. We strongly recommend carrying out calibrations on a regular basis depending on operation frequency. For the correct calibration of the viscometer, please contact your local dealer. Calibration must not be verified using viscosity values in cP´s.

7 Accessories (optional)

thermal printer
special paste spindle
standard certified oil (Krebs)

8 About viscosity

Description of KREBS unit

The digital KREBS viscometer is based on the stormer mechanical system (one blade that rotates at constant speed). The variation between products (viscosity) is determined by modifying the weight (grams) needed to maintain such constant velocity.
KU (KREB-units) is a scale normally used to refer to “viscosity" or “consistency” of paints applied by brush or with roller.
The equivalence in cP must only be considered on an information level and should never be compared with the measurement readings obtained with other viscometer types.

KREBS unit is defined by following equation:

- For viscosity ranges between 200 – 2100 cP
- $KU=1,1187 + 0,8542 \ln(0,1938v + 36) – 0,0443[\ln(0,1938v + 36)]^2$
- For viscosity ranges between 2100 – 5000 cP
- $KU=1, 8118 + 0,596 \ln(0,1938v + 36) – 0,0206[\ln(0,1938v + 36)]^2$

where:
KU means viscosity in KREBS-units
v means viscosity in cP

9 Viscosity table

g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP
			101	60,9	366	176	77,2	735	251	89,1	1104	326	97,6	1472	401	104,1	1841	476	110,1	2210	551	116,1	2579
			102	61,1	371	177	77,4	740	252	89,2	1109	327	97,7	1477	402	104,2	1846	477	110,2	2215	552	116,2	2584
			103	61,4	376	178	77,6	745	253	89,3	1113	328	97,8	1482	403	104,2	1851	478	110,2	2220	553	116,2	2589
			104	61,6	381	179	77,8	750	254	89,4	1118	329	97,9	1487	404	104,3	1856	479	110,3	2225	554	116,3	2594
			105	**61,9**	**386**	**180**	**78,0**	**754**	**255**	**89,6**	**1123**	**330**	**98,0**	**1492**	**405**	**104,4**	**1861**	**480**	**110,4**	**2230**	**555**	**116,4**	**2599**
			106	62,1	391	181	78.2,	759	256	89,7	1128	331	98,1	1497	406	104,5	1866	481	110,5	2235	556	116,5	2604
32	40,2	27	107	62,4	395	182	78.4	764	257	89,8	1133	332	98,2	1502	407	104,6	1871	482	110,6	2240	557	116,6	2609
33	40,6	32	108	62,6	400	183	78.6	769	258	89,9	1138	333	98,3	1507	408	104,6	1876	483	110,6	2245	558	116,6	2613
34	40,9	36	109	62,8	405	184	78.8'	774	259	90,1	1143	334	98,4	1512	409	104,7	1881	484	110,7	2250	559	116,7	2618
35	**41,3**	**41**	**110**	**63,1**	**410**	**185**	**79,0**	**779**	**260**	**90,2**	**1148**	**335**	**98,5**	**1517**	**410**	**104,8**	**1886**	**485**	**110,8**	**2254**	**560**	**116,8**	**2623**
36	41,6	46	111	63,3	415	186	79,1	784	261	90,3	1153	336	98,6	1522	411	104,9	1891	486	110,9	2259	561	116,9	2628
37	42,0	51	112	63,6	420	187	79,3	789	262	90,4	1158	337	98,7	1527	412	105,0	1895	487	111,0	2264	562	117,0	2633
38	42,3	56	113	63,8	425	188	79,5	794	263	90,6	1163	338	98,8	1532	413	105,0	1900	488	111,0	2269	563	117,0	2638
39	42,6	61	114	64,0	430	189	79,7	799	264	90,7	1168	339	98,9	1536	414	105,1	1905	489	111,1	2274	564	117,1	2643
40	**43,0**	**66**	**115**	**64,3**	**435**	**190**	**79,9**	**804**	**265**	**90,8**	**1172**	**340**	**99,0**	**1541**	**415**	**105,2**	**1910**	**490**	**111,2**	**2279**	**565**	**117,2**	**2648**
41	43,3	71	116	64,5	440	191	80,1	809	266	90,9	1177	341	99,1	1546	416	105,3	1915	491	111,3	2284	566	117,3	2653
42	43,6	76	117	64,7	445	192	80,3	813	267	91,0	1182	342	99,2	1551	417	105,4	1920	492	111,4	2289	567	117,4	2658
43	44,0	81	118	65,0	450	193	80,4	818	268	91,2	1187	343	99,3	1556	418	105,4	1925	493	111,4	2294	568	117,4	2663
44	44,3	86	119	65,2	454	194	80,6	823	269	91,3	1192	344	99,4	1561	419	105,5	1930	494	111,5	2299	569	117,5	2668
45	**44,6**	**91**	**120**	**65,4**	**459**	**195**	**80,8**	**828**	**270**	**91,4**	**1197**	**345**	**99,4**	**1566**	**420**	**105,6**	**1935**	**495**	**111,6**	**2304**	**570**	**117,6**	**2672**
46	45,0	95	121	65,7	464	196	81,0	833	271	91,5	1202	346	99,5	1571	421	105,7	1940	496	111,7	2309	571	117,7	2677
47	45,3	100	122	65,9	469	197	81,2	838	272	91,6	1207	347	99,6	1576	422	105,8	1945	497	111,8	2313	572	117,7	2682
48	45,6	105	123	66,1	474	198	81,3	843	273	91,8	1212	348	99,7	1581	423	105,8	1950	498	111,8	2318	573	117,8	2687
49	45,9	110	124	66,3	479	199	81,5	848	274	91,9	1217	349	99,8	1586	424	105,9	1954	499	111,9	2323	574	117,9	2692
50	**46,3**	**115**	**125**	**66,6**	**484**	**200**	**81,7**	**853**	**275**	**92,0**	**1222**	**350**	**99,9**	**1591**	**425**	**106,0**	**1959**	**500**	**112,0**	**2328**	**575**	**117,9**	**2697**
51	46,6	120	126	66,8	489	201	81,8	858	276	92,1	1227	351	100,0	1595	426	106,1	1964	501	112,1	2333	576	118,0	2702
52	46,9	125	127	67,0	494	202	82,0	863	277	92,2	1232	352	100,1	1600	427	106,2	1969	502	112,2	2338	577	118,1	2707
53	47,2	130	128	67,2	499	203	82,2	868	278	92,3	1236	353	100,2	1605	428	106,2	1974	503	112,2	2343	578	118,2	2712
54	47,5	135	129	67,5	504	204	82,3	872	279	92,5	1241	354	100,3	1610	429	106,3	1979	504	112,3	2348	579	118,2	2717
55	**47,9**	**140**	**130**	**67,7**	**509**	**205**	**82,5**	**877**	**280**	**92,6**	**1246**	**355**	**100,3**	**1615**	**430**	**106,4**	**1984**	**505**	**112,4**	**2353**	**580**	**118,3**	**2722**
56	48,2	145	131	67,9	513	206	82,7	882	281	92,7	1251	356	100,4	1620	431	106,5	1989	506	112,5	2358	581	118,4	2727
57	48,5	150	132	68,1	518	207	82,8	887	282	92,8	1256	357	100,5	1625	432	106,6	1994	507	112,6	2363	582	118,4	2732
58	48,8	154	133	68,4	523	208	83,0	892	283	92,9	1261	358	100,6	1630	433	106,6	1999	508	112,6	2368	583	118,5	2736
59	49,1	159	134	68,6	528	209	83,2	897	284	93,0	1266	359	100,7	1635	434	106,7	2004	509	112,7	2372	584	118,6	2741
60	**49,4**	**164**	**135**	**68,8**	**533**	**210**	**83,3**	**902**	**285**	**93,2**	**1271**	**360**	**100,8**	**1640**	**435**	**106,8**	**2009**	**510**	**112,8**	**2377**	**585**	**118,6**	**2746**
61	49,7	169	136	69,0	538	211	83,5	907	286	93,3	1276	361	100,9	1645	436	106,9	2013	511	112,9	2382	586	118,7	2751
62	50,0	174	137	69,2	543	212	83,6	912	287	93,4	1281	362	101,0	1650	437	107,0	2018	512	113,0	2387	587	118,8	2756
63	50,3	179	138	69,5	548	213	83,8	917	288	93,5	1286	363	101,0	1654	438	107,0	2023	513	113,0	2392	588	118,8	2761
64	50,6	184	139	69,7	553	214	84,0	922	289	93,6	1291	364	101,1	1659	439	107,1	2028	514	113,1	2397	589	118,9	2766
65	**50,9**	**189**	**140**	**69,9**	**558**	**215**	**84,1**	**927**	**290**	**93,7**	**1295**	**365**	**101,2**	**1664**	**440**	**107,2**	**2033**	**515**	**113,2**	**2402**	**590**	**119,0**	**2771**
66	51,2	194	141	70,1	563	216	84,3	932	291	93,8	1300	366	101,3	1669	441	107,3	2038	516	113,3	2407	591	119,0	2776
67	51,5	199	142	70,3	568	217	84,4	936	292	94,0	1305	367	101,4	1674	442	107,4	2043	517	113,4	2412	592	119,1	2781
68	51,8	204	143	70,5	572	218	84,5	941	293	94,1	1310	368	101,4	1679	443	107,4	2048	518	113,4	2417	593	119,2	2786
69	52,1	209	144	70,7	577	219	84,7	946	294	94,2	1315	369	101,5	1684	444	107,5	2053	519	113,5	2422	594	119,2	2791
70	**52,4**	**213**	**145**	**71,0**	**582**	**220**	**84,8**	**951**	**295**	**94,3**	**1320**	**370**	**101,6**	**1689**	**445**	**107,6**	**2058**	**520**	**113,6**	**2427**	**595**	**119,3**	**2795**
71	52,7	218	146	71,2	587	221	85,0	956	296	94,4	1325	371	101,7	1694	446	107,7	2063	521	113,7	2432	596	119,4	2800
72	53,0	223	147	71,4	592	222	85,1	961	297	94,5	1330	372	101,8	1699	447	107,8	2068	522	113,8	2436	597	119,4	2805
73	53,3	228	148	71,6	597	223	85,3	966	298	94,6	1335	373	101,8	1704	448	107,8	2072	523	113,8	2441	598	119,5	2810
74	53,6	233	149	71,8	602	224	85,4	971	299	94,7	1340	374	101,9	1709	449	107,9	2077	524	113,9	2446	599	119,5	2815
75	**53,9**	**238**	**150**	**72,0**	**607**	**225**	**85,6**	**976**	**300**	**94,8**	**1345**	**375**	**102,0**	**1713**	**450**	**108,0**	**2082**	**525**	**114,0**	**2451**	**600**	**119,6**	**2820**
76	54,2	243	151	72,2	612	226	85,7	981	301	95,0	1350	376	102,1	1718	451	108,1	2087	526	114,1	2456	601	119,7	2825
77	54,5	248	152	72,4	617	227	85,9	986	302	95,1	1354	377	102,2	1723	452	108,2	2092	527	114,2	2461	602	119,7	2830
78	54,8	253	153	72,6	622	228	86,0	991	303	95,2	1359	378	102,2	1728	453	108,2	2097	528	114,2	2466	603	119,8	2835
79	55,0	258	154	72,8	627	229	86,1	995	304	95,3	1364	379	102,3	1733	454	108,3	2102	529	114,3	2471	604	119,8	2840
80	**55,3**	**263**	**155**	**73,0**	**632**	**230**	**86,3**	**1000**	**305**	**95,4**	**1369**	**380**	**102,4**	**1738**	**455**	**108,4**	**2107**	**530**	**114,4**	**2476**	**605**	**119,9**	**2845**
81	55,6	268	156	73,2	636	231	86,4	1005	306	95,5	1374	381	102,5	1743	456	108,5	2112	531	114,5	2481	606	120,0	2850
82	55,9	272	157	73,4	641	232	86,6	1010	307	95,6	1379	382	102,6	1748	457	108,6	2117	532	114,6	2486	607	120,0	2854
83	56,2	277	158	73,6	646	233	86,7	1015	308	95,7	1384	383	102,6	1753	458	108,6	2122	533	114,6	2491	608	120,1	2859
84	56,5	282	159	73,8	651	234	86,8	1020	309	95,8	1389	384	102,7	1758	459	108,7	2127	534	114,7	2495	609	120,1	2864
85	**56,7**	**287**	**160**	**74,0**	**656**	**235**	**87,0**	**1025**	**310**	**95,9**	**1394**	**385**	**102,8**	**1763**	**460**	**108,8**	**2132**	**535**	**114,8**	**2500**	**610**	**120,2**	**2869**
86	57,0	292	161	74,2	661	236	87,1	1030	311	96,0	1399	386	102,9	1768	461	108,9	2136	536	114,9	2505	611	120,2	2874
87	57,3	297	162	74,4	666	237	87,2	1035	312	96,1	1404	387	103,0	1772	462	109,0	2141	537	115,0	2510	612	120,3	2879
88	57,6	302	163	74,6	671	238	87,4	1040	313	96,2	1409	388	103,0	1777	463	109,0	2146	538	115,0	2515	613	120,3	2884
89	57,8	307	164	74,8	676	239	87,5	1045	314	96,3	1413	389	103,1	1782	464	109,1	2151	539	115,1	2520	614	120,4	2889
90	**58,1**	**312**	**165**	**75,0**	**681**	**240**	**87,6**	**1050**	**315**	**96,4**	**1418**	**390**	**103,2**	**1787**	**465**	**109,2**	**2156**	**540**	**115,2**	**2525**	**615**	**120,4**	**2894**
91	58,4	317	166	75,2	686	241	87,8	1054	316	96,5	1423	391	103,3	1792	466	109,3	2161	541	115,3	2530	616	120,5	2899
92	58,6	322	167	75,4	691	242	87,9	1059	317	96,7	1428	392	103,4	1797	467	109,4	2166	542	115,4	2535	617	120,6	2904
93	58,9	327	168	75,6	695	243	88,0	1064	318	96,8	1433	393	103,4	1802	468	109,4	2171	543	115,4	2540	618	120,6	2909
94	59,1	332	169	75,8	700	244	88,2	1069	319	96,9	1438	394	103,5	1807	469	109,5	2176	544	115,5	2545	619	120,7	2913
95	**59,4**	**336**	**170**	**76,0**	**705**	**245**	**88,3**	**1074**	**320**	**97,0**	**1443**	**395**	**103,6**	**1812**	**470**	**109,6**	**2181**	**545**	**115,6**	**2550**	**620**	**120,7**	**2918**
96	59,6	341	171	76,2	710	246	88,4	1079	321	97,1	1448	396	103,7	1817	471	109,7	2186	546	115,7	2554	621	120,8	2923
97	59,9	346	172	76,4	715	247	88,6	1084	322	97,2	1453	397	103,8	1822	472	109,8	2191	547	115,8	2559	622	120,8	2928
98	60,1	351	173	76,6	720	248	88,7	1089	323	97,3	1458	398	103,8	1827	473	109,8	2195	548	115,8	2564	623	120,9	2933
99	60,4	356	174	76,8	725	249	88,8	1094	324	97,4	1463	399	103,9	1832	474	109,9	2200	549	115,9	2569	624	120,9	2938
100	**60,6**	**361**	**175**	**77,0**	**730**	**250**	**88,9**	**1099**	**325**	**97,5**	**1468**	**400**	**104,0**	**1836**	**475**	**110,0**	**2205**	**550**	**116,0**	**2574**	**625**	**121,0**	**2943**

g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP
626	121,0	2948	701	125,1	3317	776	129,7	3686	851	133,8	4054	926	137,0	4423	1001	139,8	4792	1076	141,0	5161
627	121,1	2953	702	125,1	3322	777	129,8	3691	852	133,9	4059	927	137,1	4428	1002	139,8	4797	1077	141,0	5166
628	121,1	2958	703	125,2	3327	778	129,8	3695	853	133,9	4064	928	137,1	4433	1003	139,8	4802	1078	141,0	5171
629	121,2	2963	704	125,2	3332	779	129,9	3700	854	134,0	4069	929	137,2	4438	1004	139,8	4807	1079	141,0	5176
630	**121,2**	**2968**	**705**	**125,3**	**3336**	**780**	**130,0**	**3705**	**855**	**134,0**	**4074**	**930**	**137,2**	**4443**	**1005**	**139,9**	**4812**	**1080**	**141,0**	**5181**
631	121,3	2972	706	125,4	3341	781	130,0	3710	856	134,0	4079	931	137,2	4448	1006	139,9	4817	1081	141,0	5186
632	121,3	2977	707	125,4	3346	782	130,1	3715	857	134,1	4084	932	137,3	4453	1007	139,9	4822	1082	141,0	5191
633	121,4	2982	708	125,5	3351	783	130,2	3720	858	134,1	4089	933	137,3	4458	1008	139,9	4827	1083	141,0	5195
634	121,4	2987	709	125,5	3356	784	130,2	3725	859	134,2	4094	934	137,4	4463	1009	139,9	4832	1084	141,0	5200
635	**121,5**	**2992**	**710**	**125,6**	**3361**	**785**	**130,3**	**3730**	**860**	**134,2**	**4099**	**935**	**137,4**	**4468**	**1010**	**139,9**	**4836**	**1085**	**141,0**	**5205**
636	121,6	2997	711	125,7	3366	786	130,4	3735	861	134,3	4104	936	137,4	4472	1011	139,9	4841	1086	141,0	5210
637	121,6	3002	712	125,7	3371	787	130,4	3740	862	134,3	4109	937	137,5	4477	1012	140,0	4846	1087	141,0	5215
638	121,7	3007	713	125,8	3376	788	130,5	3745	863	134,4	4113	938	137,5	4482	1013	140,0	4851	1088	141,0	5220
639	121,7	3012	714	125,8	3381	789	130,5	3750	864	134,4	4118	939	137,6	4487	1014	140,0	4856	1089	141,0	5225
640	**121,8**	**3017**	**715**	**125,9**	**3386**	**790**	**130,6**	**3754**	**865**	**134,5**	**4123**	**940**	**137,6**	**4492**	**1015**	**140,0**	**4861**	**1090**	**141,0**	**5230**
641	121,8	3022	716	126,0	3391	791	130,7	3759	866	134,5	4128	941	137,6	4497	1016	140,0	4866	1091	141,0	5235
642	121,9	3027	717	126,0	3395	792	130,7	3764	867	134,6	4133	942	137,7	4502	1017	140,0	4871	1092	141,0	5240
643	121,9	3032	718	126,1	3400	793	130,8	3769	868	134,6	4138	943	137,7	4507	1018	140,0	4876	1093	141,0	5245
644	122,0	3036	719	126,1	3405	794	130,8	3774	869	134,7	4143	944	137,8	4512	1019	140,1	4881	1094	141,0	5250
645	**122,0**	**3041**	**720**	**126,2**	**3410**	**795**	**130,9**	**3779**	**870**	**134,7**	**4148**	**945**	**137,8**	**4517**	**1020**	**140,1**	**4886**	**1095**	**141,0**	**5254**
646	122,0	3046	721	126,3	3415	796	131,0	3784	871	134,8	4153	946	137,8	4522	1021	140,1	4891	1096	141,0	5259
647	122,1	3051	722	126,3	3420	797	131,0	3789	872	134,8	4158	947	137,9	4527	1022	140,1	4895	1097	141,0	5264
648	122,1	3056	723	126,4	3425	798	131,1	3794	873	134,9	4163	948	137,9	4532	1023	140,1	4900	1098	141,0	5269
649	122,2	3061	724	126,4	3430	799	131,1	3799	874	134,9	4168	949	138,0	4536	1024	140,1	4905	1099	141,0	5274
650	**122,2**	**3066**	**725**	**126,5**	**3435**	**800**	**131,2**	**3804**	**875**	**134,9**	**4172**	**950**	**138,0**	**4541**	**1025**	**140,1**	**4910**			
651	122,3	3071	726	126,6	3440	801	131,2	3809	876	135,0	4177	951	138,0	4546	1026	140,2	4915			
652	122,3	3076	727	126,6	3445	802	131,3	3813	877	135,0	4182	952	138,1	4551	1027	140,2	4920			
653	122,4	3081	728	126,7	3450	803	131,3	3818	878	135,1	4187	953	138,1	4556	1028	140,2	4925			
654	122,4	3086	729	126,7	3454	804	131,4	3823	879	135,1	4192	954	138,2	4561	1029	140,2	4930			
655	**122,5**	**3091**	**730**	**126,8**	**3459**	**805**	**131,4**	**3828**	**880**	**135,2**	**4197**	**955**	**138,2**	**4566**	**1030**	**140,2**	**4935**			
656	122,6	3095	731	126,9	3464	806	131,5	3833	881	135,2	4202	956	138,2	4571	1031	140,2	4940			
657	122,6	3100	732	126,9	3469	807	131,6	3838	882	135,3	4207	957	138,3	4576	1032	140,2	4945			
658	122,7	3105	733	127,0	3474	808	131,6	3843	883	135,3	4212	958	138,3	4581	1033	140,3	4950			
659	122,7	3110	734	127,0	3479	809	131,7	3848	884	135,4	4217	959	138,4	4586	1034	140,3	4954			
660	**122,8**	**3115**	**735**	**127,1**	**3484**	**810**	**131,7**	**3853**	**885**	**135,4**	**4222**	**960**	**138,4**	**4591**	**1035**	**140,3**	**4959**			
661	122,8	3120	736	127,2	3489	811	131,8	3858	886	135,4	4227	961	138,4	4595	1036	140,3	4964			
662	122,9	3125	737	127,2	3494	812	131,8	3863	887	135,5	4232	962	138,5	4600	1037	140,3	4969			
663	122,9	3130	738	127,3	3499	813	131,9	3868	888	135,5	4236	963	138,5	4605	1038	140,4	4974			
664	123,0	3135	739	127,3	3504	814	131,9	3872	889	135,6	4241	964	138,6	4610	1039	140,4	4979			
665	**123,0**	**3140**	**740**	**127,4**	**3509**	**815**	**132,0**	**3877**	**890**	**135,6**	**4246**	**965**	**138,6**	**4615**	**1040**	**140,4**	**4984**			
666	123,1	3145	741	127,5	3513	816	132,0	3882	891	135,6	4251	966	138,6	4620	1041	140,4	4989			
667	123,1	3150	742	127,5	3518	817	132,1	3887	892	135,7	4256	967	138,7	4625	1042	140,4	4994			
668	123,2	3154	743	127,6	3523	818	132,1	3892	893	135,7	4261	968	138,7	4630	1043	140,5	4999			
669	123,2	3159	744	127,6	3528	819	132,2	3897	894	135,8	4266	969	138,8	4635	1044	140,5	5004			
670	**123,3**	**3164**	**745**	**127,7**	**3533**	**820**	**132,2**	**3902**	**895**	**135,8**	**4271**	**970**	**138,8**	**4640**	**1045**	**140,5**	**5009**			
671	123,3	3169	746	127,8	3538	821	132,3	3907	896	135,8	4276	971	138,8	4645	1046	140,5	5013			
672	123,4	3174	747	127,8	3543	822	132,3	3912	897	135,9	4281	972	138,9	4650	1047	140,5	5018			
673	123,4	3179	748	127,9	3548	823	132,4	3917	898	135,9	4286	973	138,9	4654	1048	140,6	5023			
674	123,5	3184	749	128,0	3553	824	132,4	3922	899	136,0	4291	974	139,0	4659	1049	140,6	5028			
675	**123,6**	**3189**	**750**	**128,0**	**3558**	**825**	**132,5**	**3927**	**900**	**136,0**	**4295**	**975**	**139,0**	**4664**	**1050**	**140,6**	**5033**			
676	123,6	3194	751	128,1	3563	826	132,6	3932	901	136,0	4300	976	139,0	4669	1051	140,6	5038			
677	123,7	3199	752	128,2	3568	827	132,6	3936	902	136,1	4305	977	139,1	4674	1052	140,6	5043			
678	123,7	3204	753	128,2	3572	828	132,7	3941	903	136,1	4310	978	139,1	4679	1053	140,7	5048			
679	123,8	3209	754	128,3	3577	829	132,7	3946	904	136,2	4315	979	139,1	4684	1054	140,7	5053			
680	**123,8**	**3213**	**755**	**128,4**	**3582**	**830**	**132,8**	**3951**	**905**	**136,2**	**4320**	**980**	**139,2**	**4689**	**1055**	**140,7**	**5058**			
681	123,9	3218	756	128,4	3587	831	132,8	3956	906	136,2	4325	981	139,2	4694	1056	140,7	5063			
682	123,9	3223	757	128,5	3592	832	132,9	3961	907	136,3	4330	982	139,2	4699	1057	140,7	5068			
683	124,0	3228	758	128,6	3597	833	132,9	3966	908	136,3	4335	983	139,3	4704	1058	140,7	5072			
684	124,0	3233	759	128,6	3602	834	133,0	3971	909	136,4	4340	984	139,3	4709	1059	140,8	5077			
685	**124,1**	**3238**	**760**	**128,7**	**3607**	**835**	**133,0**	**3976**	**910**	**136,4**	**4345**	**985**	**139,3**	**4713**	**1060**	**140,8**	**5082**			
686	124,2	3243	761	128,7	3612	836	133,0	3981	911	136,4	4350	986	139,4	4718	1061	140,8	5087			
687	124,2	3248	762	128,8	3617	837	133,1	3986	912	136,5	4354	987	139,4	4723	1062	140,8	5092			
688	124,3	3253	763	128,9	3622	838	133,1	3991	913	136,5	4359	988	139,4	4728	1063	140,8	5097			
689	124,3	3258	764	128,9	3627	839	133,2	3995	914	136,6	4364	989	139,5	4733	1064	140,8	5102			
690	**124,4**	**3263**	**765**	**129,0**	**3632**	**840**	**133,2**	**4000**	**915**	**136,6**	**4369**	**990**	**139,5**	**4738**	**1065**	**140,8**	**5107**			
691	124,5	3268	766	129,1	3636	841	133,3	4005	916	136,6	4374	991	139,5	4743	1066	140,9	5112			
692	124,5	3272	767	129,1	3641	842	133,3	4010	917	136,7	4379	992	139,6	4748	1067	140,9	5117			
693	124,6	3277	768	129,2	3646	843	133,4	4015	918	136,7	4384	993	139,6	4753	1068	140,9	5122			
694	124,6	3282	769	129,3	3651	844	133,4	4020	919	136,8	4389	994	139,6	4758	1069	140,9	5127			
695	**124,7**	**3287**	**770**	**129,3**	**3656**	**845**	**133,5**	**4025**	**920**	**136,8**	**4394**	**995**	**139,6**	**4763**	**1070**	**140,9**	**5132**			
696	124,8	3292	771	129,4	3661	846	133,6	4030	921	136,8	4399	996	139,7	4768	1071	140,9	5136			
697	124,8	3297	772	129,5	3666	847	133,6	4035	922	136,9	4404	997	139,7	4772	1072	140,9	5141			
698	124,9	3302	773	129,5	3671	848	133,7	4040	923	136,9	4409	998	139,7	4777	1073	140,9	5146			
699	124,9	3307	774	129,6	3676	849	133,7	4045	924	137,0	4413	999	139,7	4782	1074	140,9	5151			
700	**125,0**	**3312**	**775**	**129,7**	**3681**	**850**	**133,8**	**4050**	**925**	**137,0**	**4418**	**1000**	**139,8**	**4787**	**1075**	**140,9**	**5156**			

10 Troubleshooting

Problem	Solution
The instrument doesn't work	• Check the mains switch
	• Check the connection to the mains
The instrument makes no reading = 0 when measuring without sample	• Check if instrument is correctly levelled
	• Contact your distributor
The viscosity reading is unstable or not very accurate	• Check if instrument is correctly levelled
	• Check if temperature of sample is stable
	• Check the characteristics of the sample that must be analyzed